

## PATENT COOPERATION TREATY

## PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 20020749WO		FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/FI 2003/000292	International filing date (day/month/year) 15.04.2003	Priority date (day/month/year) 19.04.2002	
International Patent Classification (IPC) or national classification and IPC C22B 3/42 // C22B 15:00			
Applicant Outokumpu Oyj et al			

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 3 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
  - ☒ (sent to the applicant and to the International Bureau) a total of 2 sheets, as follows:
    - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

- This report contains indications relating to the following items:
 

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application

Date of submission of the demand 23.10.2003	Date of completion of this report 26.05.2004
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## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI 2003/000292

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☒ This report is based on a translation from the original language into the following language English, which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))  
☒ publication of the international application (under Rule 12.4)  
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-8 as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☒ the claims:

pages \_\_\_\_\_ as originally filed/furnished

pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19

pages\* 9-10 received by this Authority on 24.5.2004

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☐ the drawings:

pages \_\_\_\_\_ as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/figs \_\_\_\_\_

☐ the sequence listing (specify): \_\_\_\_\_

☐ any table(s) related to the sequence listing (specify): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/figs \_\_\_\_\_

☐ the sequence listing (specify): \_\_\_\_\_

☐ any table(s) related to the sequence listing (specify): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI 2003/000292

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

## 1. Statement

Novelty (N)	Claims	<u>1-13</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-13</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-13</u>	YES
	Claims		NO

## 2. Citations and explanations (Rule 70.7)

Documents cited as being of particular relevance:

D1 Metallurgical and Materials Transactions B, Volume 28B, No 987, December 1997, Tamas Kekesi et al

D2 US 3951649

Amended claims 1-13 were filed on 24 May 2004.

The invention relates to the removal of metal impurities from a strong chloride solution of monovalent copper by using chelating ion-exchange resins.

D1 and D2 disclose the removal of impurities from strong chloride solutions of monovalent copper. D1 discloses the use of an anion-exchange resin for removal of impurities but neither D1 nor D2 discloses the use of chelating ion-exchange resins. Consequently, the method defined by claim 1 is novel.

The stated difference implies improvements in removing impurities from a strong chloride solution of monovalent copper down to a level of a few milligrams per liter. The cuprous chloride is left in the solution.

Therefore, the method defined by claims 1-13 is considered to involve an inventive step and also to fulfil the criteria of industrial applicability.

FIG. 3A AADJ

## PATENT CLAIMS

1. A method for the removal of metal impurities in chloride-based copper recovery processes, **characterised in that** the metal impurities are removed from a strong chloride solution of monovalent copper using ion exchange.
2. A method according to claim 1, **characterised in that** chelating ion-exchange resins are used for the removal of metal impurities.
3. A method according to claims 1 or 2, **characterised in that** there is a styrene-divinyl-benzene matrix of ring structure in the ion-exchange resin.
4. A method according to some of the above claims, **characterised in that** the functional group of the ion-exchange resin is the iminodiacetic acid group.
5. A method according to claims 1, 2 or 3, **characterised in that**, the functional group of the ion-exchange resin is the aminophosphonic group.
6. A method according to some of the above claims, **characterised in that** the metal impurity to be removed is one or more of the group of zinc, nickel, lead, iron and manganese.
7. A method according to some of the above claims, **characterised in that** the alkali chloride content of the strong chloride solution is at least 200 g/l.

FIG. 1  
ART 34 A44B

8. A method according to some of the above claims, **characterised in that** the amount of monovalent copper in the solution to be purified is 30 – 100 g/l.
- 5 9. A method according to some of the above claims, **characterised in that** the removal of metal impurities is carried out in an acidic environment.
- 10 10. A method according to some of the above claims, **characterised in that** the removal of metal impurities is carried out in a neutral environment.
- 15 11. A method according to some of the above claims, **characterised in that** the copper-containing chloride solution that is the mother liquor in the resin is displaced before elution with an NaCl solution and that the alkaline solution to be used for regenerating the resin is displaced with an NaCl solution before the copper-containing chloride solution is fed into the resin.
- 20 12. A method for the removal of metal impurities in chloride-based copper recovery processes, **characterised in that** the majority of the metal impurities in the strong chloride solution of monovalent copper are removed by hydroxide precipitation and the rest by using ion exchange.
- 25 13. A method according to claim 10, **characterised in that** the metal impurities are removed by hydroxide precipitation to a content of 0.1 – 1 g/l, after which the final purification is made using ion exchange.
- 30 14. A method according to some of the above claims, **characterised in that** impurities are removed from a strong chloride solution of copper

REPLACED BY  
ART 24 ALTERN

by ion exchange at least to a level that corresponds to cathode copper LME-A grade impurity level.

- 5           15. A method for the counter-current leaching of copper raw material with  
a strong sodium chloride-copper chloride solution in several stages in  
order to form a monovalent copper(I) chloride solution and to purify  
the solution, which said cuprous chloride solution is precipitated as  
copper oxidule using alkali hydroxide and the oxidule is reduced  
further to elemental copper, and the sodium chloride solution forming  
10           in connection with copper oxidule precipitation is processed further in  
chlorine-alkali electrolysis, **characterised in that** purification of  
monovalent copper(I) chloride solution from metal impurities is  
carried out at least partially using ion exchange.